

BRIDFORD PARKWAY FEASIBILITY STUDY

Greensboro, NC

U-4006

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OVERVIEW

By the year 2010, even with the completion of all programmed transportation improvement projects (and assuming the completion of the Urban Loop), capacity deficiencies will exist along Wendover Avenue and Guilford College Road in the vicinity of I-40. These deficiencies are the result of overall traffic growth, compounded by substantial development anticipated in the Wendover and Guilford College corridors south of I-40. The most critical locations, where large volumes of traffic will be experiencing unacceptable levels of congestion, include:

- Guilford College Road at Hornaday Rd./Hairston St. (above capacity);
- Wendover Avenue at I-40 (above capacity);
- Wendover Avenue at Stanley (above capacity);
- Wendover Avenue at Big Tree Way (at capacity);
- Wendover Avenue at Bridford Parkway (near capacity);
- Guilford College Road at I-40 (near capacity).

One proposed option for relieving these deficiencies is the extension of Bridford Parkway across I-40 to Swing Road at the intersection of Burnt Poplar Road. There would be no access to I-40 at the overpass. Bridford Parkway would be constructed as a five-lane section from its current terminus to Swing Road. The western end of Big Tree Way would be realigned to create a "T" intersection with the extension of Bridford Parkway.

The effects of extending Bridford Parkway were evaluated by adapting the Greensboro travel demand model developed by NCDOT. Analysis of several model runs suggests that the impacts of this project are most significant along Guilford College Road, between Hornaday Road and Big Tree Way. The extension provides substantial relief to this section of Guilford College Road, maintaining very satisfactory levels of service. By contrast, widening this portion of Guilford College Road to a basic seven-lane section provides less relief. Even with an additional westbound right-turn lane, the Hornaday/Hairston intersection remains deficient.

Analysis of the model results reveals several other findings:

- Extending Bridford Parkway provides only minor improvements to Wendover Avenue, with volume/capacity ratios improving no more than 5%.
- Although tying Bridford Parkway into Burnt Poplar Road creates a continuous facility from Hilltop Road to the Gallimore Dairy Road interchange with I-40, there is little increase in traffic on Burnt Poplar. The new facility is far more attractive to north-south trips than to east-west trips.
- Similarly, the extension does not dramatically increase traffic on Big Tree Way, which is also an east-west corridor.

APPROACH

The effects of extending Bridford Parkway were analyzed using the 2010 Thoroughfare Plan Model developed by NCDOT. The model was implemented in TRANPLAN in 1987, using base year data from 1985. Due to the age of the model, the reliability of its forecasts has decreased, and a new regional model is being developed with a 1994 base year. This model is not yet calibrated; however, zonal socioeconomic data for 1994 and forecasts for 2025 are available, and were used (along with 1995-96 traffic counts) to modify household and employment totals in the study area traffic analysis zones (TAZs). Appendix A includes summaries of the TAZ revisions.

Although the design year remains 2010, the modified zonal totals reflect development and traffic growth that has occurred since 1985, as well as the most recent estimates of future development. The resulting traffic projections are much more consistent with current traffic volumes than are those of the original model. The network in the 2010 Thoroughfare Plan Model was also modified. Within the study area, centroid connectors and collector streets were added or relocated to more accurately distribute traffic on the network. Revisions were also made to create a network as consistent as possible with the 2010 network as currently planned (see Appendix A).

The study area is indicated in Figure 1. TAZ modifications, network revisions, and turning movement summaries, and intersection capacity analyses were performed only within this area. The more focused "influence area" shown in Figure 2 was defined based on initial analysis of model run results to include any intersections significantly impacted by the extension of Bridford Parkway. Detailed evaluation and refinement were conducted within this area only.

Model run "A" consists of 2010 daily traffic on the as-planned network. Significant differences between the as-planned network and the existing network include:

- Reconstruction of I-40/Guilford College interchange;
- Widening of Guilford College Road;
- Completion of Guilford College/Wendover Interchange;
- Completion of Urban Loop;
- Relocation of I-40/Chimney Rock interchange to Gallimore Dairy;
- Addition of separate left-turn lanes to Wendover at Sapp;
- Realignment of Hornaday, Nicholas, and Hairston at Guilford College;
- Extension of Hornaday east to Bridford Parkway;
- Intersection improvements at Wendover and Bridford (additional turn lanes and southbound through lane);
- Separate eastbound right-turn lane on Wendover at Stanley;
- Separate eastbound right-turn lane on Wendover at Landmark Center;
- Additional through lane on Wendover across I-40;
- Add right turn lane to eastbound I-40 exit onto southbound Wendover.

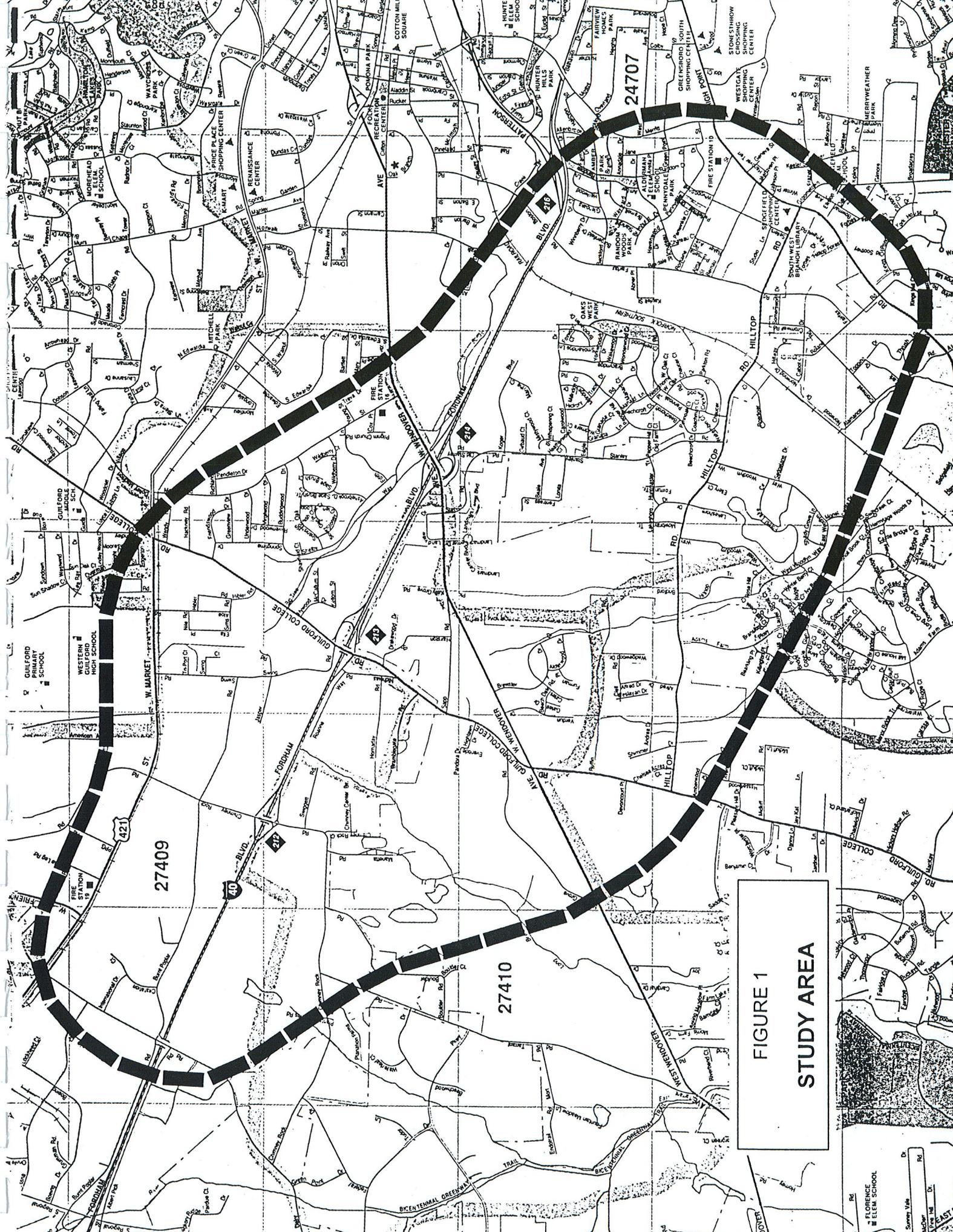


FIGURE 1
STUDY AREA

FLORENCE
ELEM SCHOOL
SUNNY VILLE
RD
EAST FC
RD

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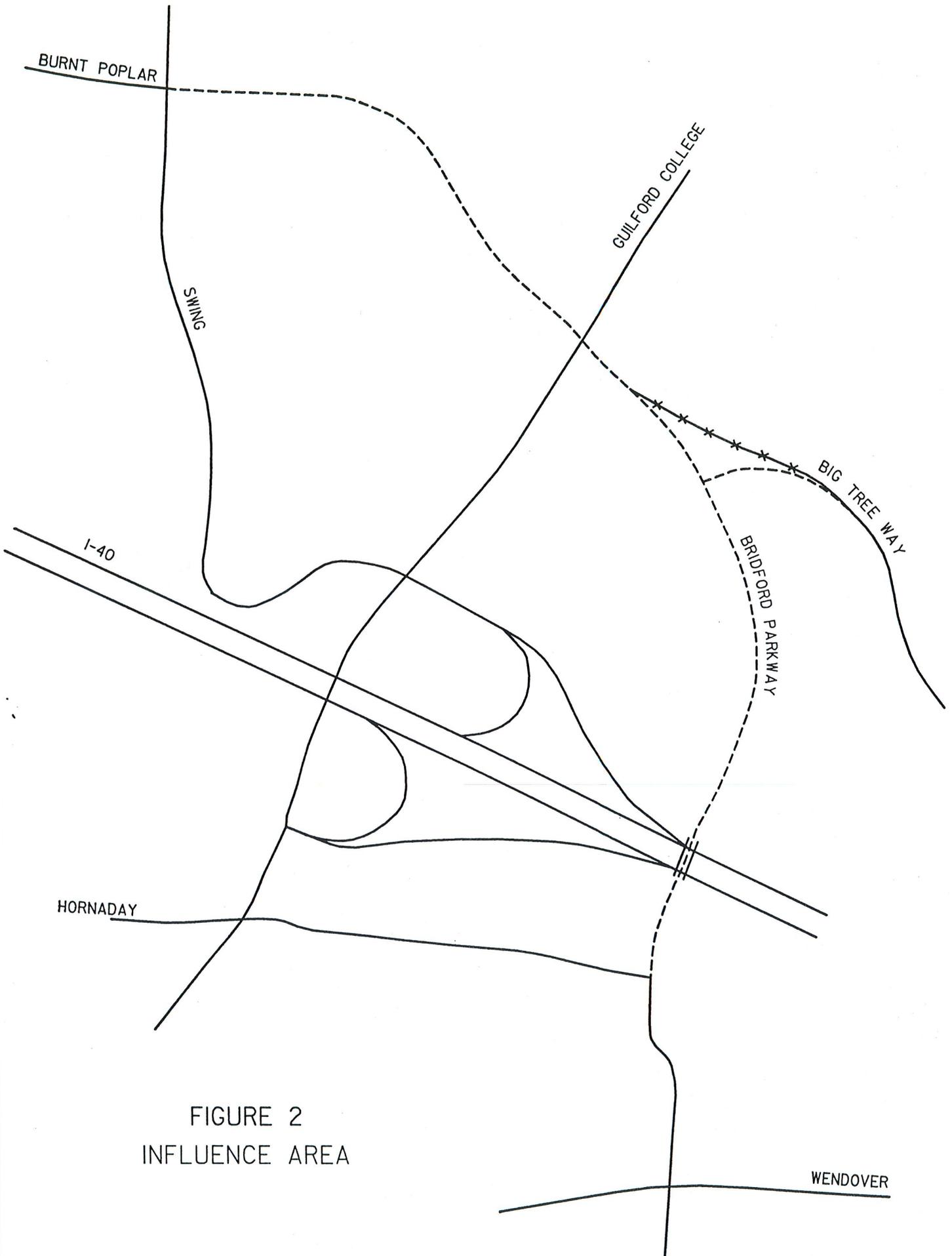


FIGURE 2
INFLUENCE AREA

Assuming completion of the entire Urban Loop by 2010 is optimistic. However, the status of the northern portion of the Urban Loop (which probably will not be open by 2010) does not affect the results of this study. The section most critical to this study, the southern bypass for I-40 and I-85, should be complete by 2010. The next most important segment, between I-40 and Bryan Boulevard, significantly reduces traffic volumes on Guilford College Road north of I-40. If this portion were not completed by 2010, the benefits of extending Bridford Parkway would be greater than indicated by this study, since traffic volumes (and congestion) on Guilford College Road would be even greater, and the Bridford Parkway extension would be the only new north-south capacity provided across western I-40. However, since completion of this leg of the Urban Loop will only be a few years away at most, not including it in the analysis could unduly bias the results in favor of extending Bridford Parkway.

Run "B" assigns the same trips to a modified as-planned network. Network "B" includes the extension of Bridford Parkway as a basic five-lane section across I-40, intersecting with Guilford College Road and tying into Burnt Poplar Road at Swing Road.

Run "A+" attempts to address some deficiencies identified in run "A" by adding through lanes to Guilford College Road between Hornaday Road and Big Tree Way. Run "A+" also includes an additional right turn lane on westbound Hairston Street.

Since the NCDOT model is based on daily vehicle-trips, model outputs are factored by 0.10 to approximate peak-hour volumes. These volumes become input for planning level analysis in the Highway Capacity Software. Table 1 lists the intersections for which capacity analysis were performed (see Appendix B for program outputs); an asterisk indicates the intersections that are significantly affected by the extension of Bridford Parkway. The evaluation focuses on these intersections. For reference, capacity analyses were also performed for existing conditions, using the latest available (1995-1996) turning movement counts.

The HCS planning analysis is appropriate for evaluating signalized intersection performance based on long-range forecasts, especially when large numbers of intersections and alternatives are involved. Given the uncertainty associated with forecasting peak-hour turning movements 10 to 20 years into the future, the generalizations and simplifying assumptions incorporated in the planning approach are reasonable. The limitations of this approach should be recognized, however. Intersections are treated in isolation, not in combination, and flexibility in designating signal timing, phasing, and lane use (i.e., shared movements) is constrained. It is likely that for a given intersection, a better level-of-service could be determined by applying more detailed operational analysis, but the credibility of such results would be suspect. For the purposes of this study, the emphasis is on large differences in level-of-service, indicated by variations in volume/capacity ratios of well over 5%.

TABLE 1

Study Area Intersections

Intersection
* I-40 EB Ramp and Wendover Ave
* I-40 WB Ramp and Wendover Ave
* Guilford College Rd and I-40 EB Ramp
* Guilford College Rd and I-40 WB Ramp
Burnt Poplar Rd and Chimney Rock Rd
* Big Tree Way and Guilford College Rd
Swing Rd and Burnt Poplar
* Big Tree Way and Wendover Ave
Guilford College Rd and Wendover Ave
* Stanley Rd. and Wendover Ave
Hilltop Rd. and Stanley Rd
Guilford College Rd and Hilltop Rd
* Guilford College Rd and Hornaday/Hairston.
Bridford Pkwy and Hilltop Rd
* Bridford Pkwy and Wendover Ave
* Bridford Pkwy and Hornaday/Hairston
Wendover Ave and Urban Loop

* Indicates significant intersection in influence area.

RESULTS

Table 2 summarizes the volume-to-capacity (v/c) ratios of the study area intersections for each model run, plus the results of v/c analysis of the current traffic volumes. Details concerning the traffic volumes, turning movements, and lane geometries of each model run are discussed below.

Run "A"

Figure 3 summarizes the forecast 2010 ADT's for the as-planned network, and indicates the assumed lane configurations. Table 3 lists the corresponding approach volumes and turning movements. Programmed projects improve or maintain v/c ratios at a number of locations, but volumes meet or exceed capacities on Wendover Avenue at Stanley and at Big Tree Way. Although v/c ratios increase by nearly 50% at both Wendover/Bridford Parkway and Guilford College/Big Tree, some additional capacity remains at each location. Conditions deteriorate to unacceptable levels at the intersection of Guilford College and Hornaday/Hairston. Capacity is adequate at the I-40/Guilford College interchange, but just barely. Minor increases in traffic growth rates could easily create severe deficiencies here.

Run "B"

The assumed approach geometries and forecast daily traffic volumes when Bridford Parkway is extended are indicated in Figure 4. Turning movements and approach volumes are shown in Table 4. Relative to run "A," conditions all along Wendover Avenue improve slightly. Conditions on Guilford College Road improve dramatically, except at the new intersection with Bridford Parkway, where the level-of-service deteriorates slightly.

Run "A+"

Figure 5 summarizes lane configuration changes made to the "A" network in response to deficiencies identified during capacity analysis. These improvements are an attempt to provide levels-of-service comparable to those found in Run "B," but without extending Bridford Parkway. Turning movements and approach volumes are the same as in Run "A" (see Table 2). Conditions improve significantly at the I-40 interchange, but not to the degree provided by extending Bridford. The Hornaday/Hairston intersection experiences some improvement, but is still well over capacity.

TABLE 2

HCS Planning Worksheet Results: Peak Hour V/C Ratios

Node	Intersection	Existing	2010 Runs		
			A	B	A+
628 EB	I-40 EB Ramp & Wendover Ave.	1.07	1.12	1.09	1.12
628 WB	I-40 WB Ramp & Wendover Ave.	0.99	0.98	0.96	0.98
629 EB	Guilford College Rd. & I-40 EB Ramp	1.30	0.73	0.50	0.58
629 WB/785	Guilford College Rd. & I-40 WB Ramp	0.95	0.94	0.62	0.79
739	Big Tree Way & Guilford College Rd.	0.54	0.76	N/A	0.76
739	Bridford Parkway & Guilford College Rd.	N/A	N/A	0.84	N/A
786	Big Tree Way & Wendover Ave.	0.86	0.99	0.94	0.99
787	Bridford Parkway & Big Tree Way	N/A	N/A	0.66	N/A
795	Stanley Rd. & Wendover Ave.	0.90	1.09	1.08	1.09
1939	Guilford College Rd. & Hornaday/Hairston Rds.	No Data	1.35	0.86	1.17
4018	Bridford Parkway and Wendover Ave.	0.63	0.93	0.93	0.93
4020	Bridford Parkway and Hornaday Rd.	N/A	N/A	0.48	N/A

Notes on Run "A+"

Improvements to node numbers 629 EB, 629 WB/785, and 1939 were the addition of one through lane in each direction on Guilford College Road.

Improvements to node 739 were the addition of an exclusive WB right turn lane and an additional left turn lane on the SB approach.

Boldface font indicates changes improvements over "A".

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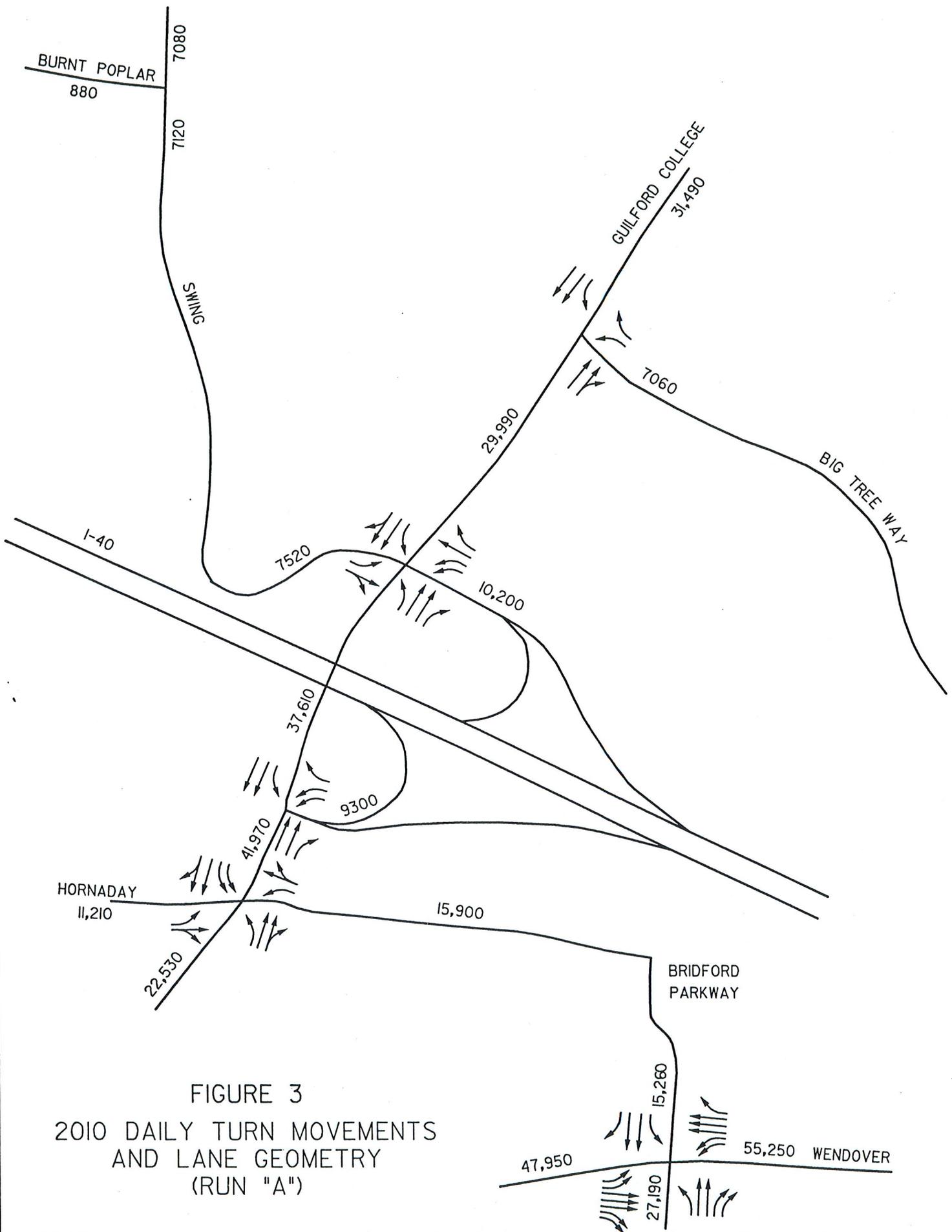


FIGURE 3

2010 DAILY TURN MOVEMENTS
AND LANE GEOMETRY
(RUN "A")

TABLE 3

RUN A: 2010 Volumes (As-Planned)

Intersection	Node	From North			From South			From East			From West						
		Rt.	St.	Lt.	Total	Rt.	St.	Lt.	Total	Rt.	St.	Lt.	Total				
I40 EB Ramp and Wendover Ave	628	0	29335	4465	61097	13593	19834	0	65105	7463			25521	2343		2343	
I40 WB Ramp and Wendover Ave	628	7500	19668	0	56350	0	24926	2371	61097	4256		14132	18388			9871	
Guilford College Rd and I 40 EB Ramp	629	0	18556	3128	37608	3637	15294	0	39476				6765	1989	630	2619	
Guilford College Rd and I 40 WB Ramp	629	439	15112	247	29379	2002	12474	1448	37608	1067	2071	3931	10198	2641	880	40	7519
Burnt Poplar Rd and Chimney Rock Rd	689	826	6183	0	13394	166	5561	182	12416	0	284	141	881	183	290	824	2589
Big Tree Way and Guilford College Rd	739	0	13256	2199	31487	1632	13951	0	29987	2081	0	1148	7060			0	
Burnt Poplar and Swing Rd	747	197	3327	0	7076	0	3330	228	7119	0	0	0	0	234	0	222	881
Big Tree Way and Wendover Ave	786	3711	0	2232	11745	0	0	0	0	2087	27922	0	60079	0	27838	3715	63186
Guilford College Rd and Wendover Ave	792	2674	8180	522	22527	14957	8236	219	46869	292	15918	15062	62569	215	15818	2623	37467
Stanley Rd. and Wendover Ave	795	0	0	0	0	6143	0	1310	14933	0	30006	6137	71941	1343	29655	0	62314
Hilltop Rd. and Stanley Rd	1932	1188	0	2816	7985	0	0	0	0	2792	5689	0	17688	0	6391	1189	14457
Guilford College Rd and Hilltop Rd	1938	6472	15584	1401	46869	787	15396	7475	47256	1419	4964	762	14951	7252	5618	6597	38378
Guilford College Rd and Hornaday/Hairston	1939	3714	10556	6762	41965	0	10480	671	22527	6791	1250	0	15897	820	1094	3662	11211
Bridford Pkwy and Hilltop Rd	4009	5591	0	1469	13878	0	0	0	0	1379	5498	0	14457	0	6111	5439	22639
Bridford Pkwy and Wendover Ave	4018	923	5453	1160	15259	5884	5310	2281	27188	1124	20707	5943	55247	2317	20429	1289	47946
Bridford Pkwy and Hornaday	4020				0				0				0				0
Wendover Ave and Urban Loop	4036	6768	17136	974	50035	2817	17081	3715	46848	977	20789	2145	47946	3954	20244	7099	62569

Volumes for intersections in bold type were manually adjusted.

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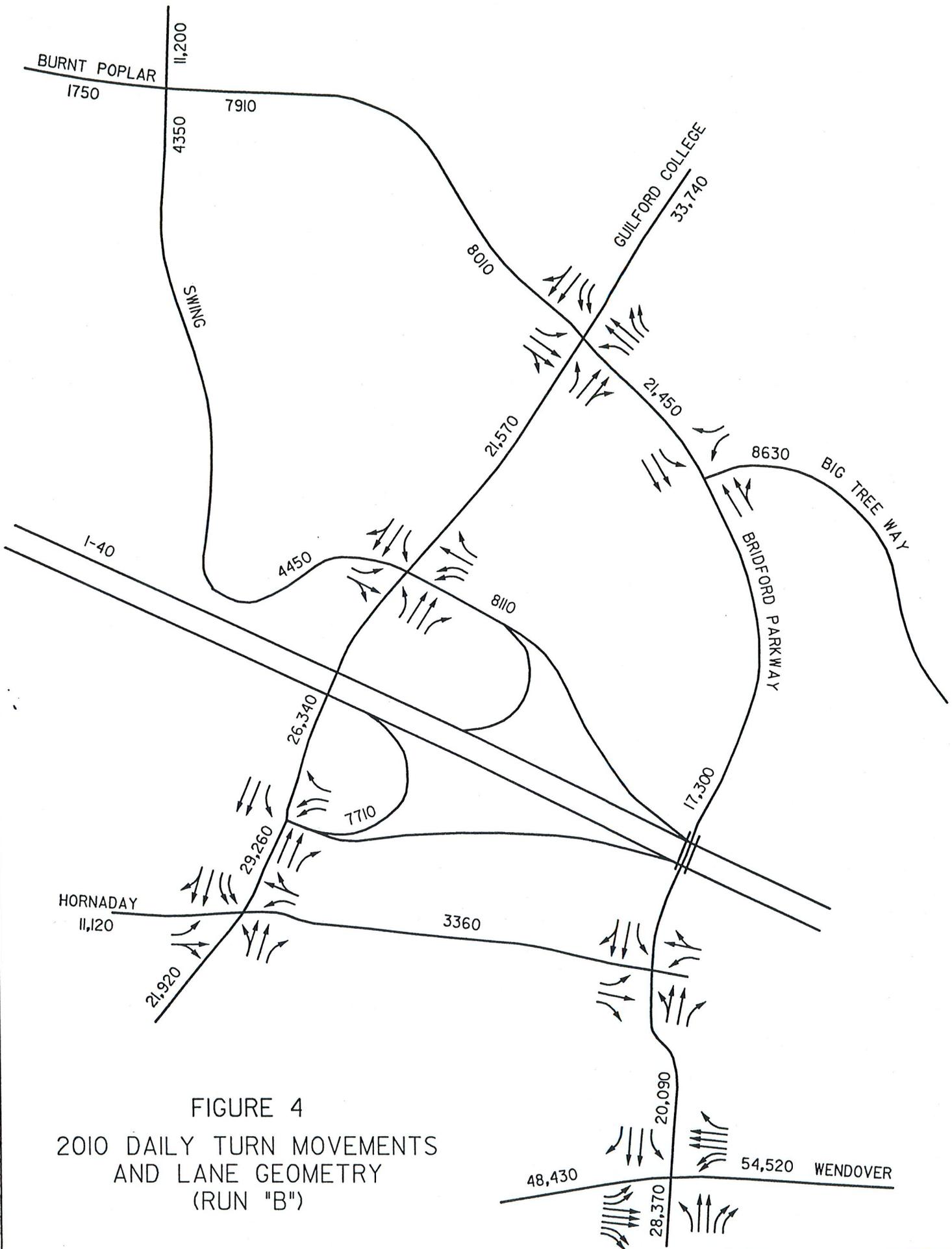


FIGURE 4
 2010 DAILY TURN MOVEMENTS
 AND LANE GEOMETRY
 (RUN "B")

TABLE 4

RUN B: 2010 Volumes (with Bridford Parkway Ext.)

Intersection	Node	From North			From South			From East			From West						
		Rt.	St.	Lt.	Total	Rt.	St.	Lt.	Total	Rt.	St.	Lt.	Total				
I40 EB Ramp and Wendover Ave	628	0	28972	4332	59281	13589	19229	0	64107	6748			24669	2317		2317	
I40 WB Ramp and Wendover Ave	628	0	23578	2399	49361	6692	19151	0	63574	4233		14153	27477			0	
Guilford College Rd and I 40 EB Ramp	629	0	12974	2674	26344	3798	10105	0	27525				6472	648	591	1239	
Guilford College Rd and I 40 WB Ramp	629	100	10001	247	20864	650	9615	431	26344	901	1749	4024	8113	1623	542	0	4445
Burnt Poplar Rd and Chimney Rock Rd	689	829	5635	356	13432	134	5448	110	11560	344	393	123	1749	399	820	2661	
Bridford Parkway ext. and Guilford Colleg	739	186	9899	6481	33741	500	10566	100	21565	6425	3749	500	21449	0	3794	184	8013
Bridford Parkway ext. and Swing Rd	747	173	1999	3439	11223	0	2019	161	4345	3409	526	0	7913	166	539	184	1749
Big Tree Way and Wendover Ave	786	3415	0	2752	12291	0	0	0	0	2710	26760	0	59018	0	26796	3414	60385
Big Tree Way and Bridford Parkway ext.	787	0	8068	2707	21449	1619	7992	0	19300	2682	0	1621	8629	0	0	0	0
Guilford College Rd and Wendover Ave	792	2680	7960	467	21920	15000	7893	218	46663	296	15924	15382	62887	210	15818	2624	37474
Stanley Rd. and Wendover Ave	795	0	0	0	0	6343	0	1281	15270	0	29312	6309	70838	1337	28874	0	60804
Hilltop Rd. and Stanley Rd	1932	1128	0	2654	7551	0	0	0	0	2605	5622	0	17102	0	6221	1164	14135
Guilford College Rd and Hilltop Rd	1938	6965	15386	1201	46663	769	15241	7482	46833	1269	4903	692	14431	7263	5597	6601	38811
Guilford College Rd and Hornaday/Hairston	1939	3760	10265	648	29226	0	10130	683	21920	650	1113	0	3356	842	945	3773	11116
Bridford Pkwy and Hilltop Rd	4009	5890	0	1396	14379	0	0	0	0	1414	5336	0	14135	0	5989	5679	22894
Bridford Pkwy and Wendover Ave	4018	1711	7039	1247	20094	5422	6914	1757	28365	1189	20803	5464	54521	1769	20396	1994	48430
Bridford Pkwy and Hornaday	4020	0	8689	0	17300	0	8611	1763	20656	0	0	0	0	1593	0	0	3356
Wendover Ave and Urban Loop	4036	7081	16881	629	49324	3289	16959	3707	47563	631	20814	2826	48430	3901	20241	7143	62887

Volumes for intersections in bold type were manually adjusted.

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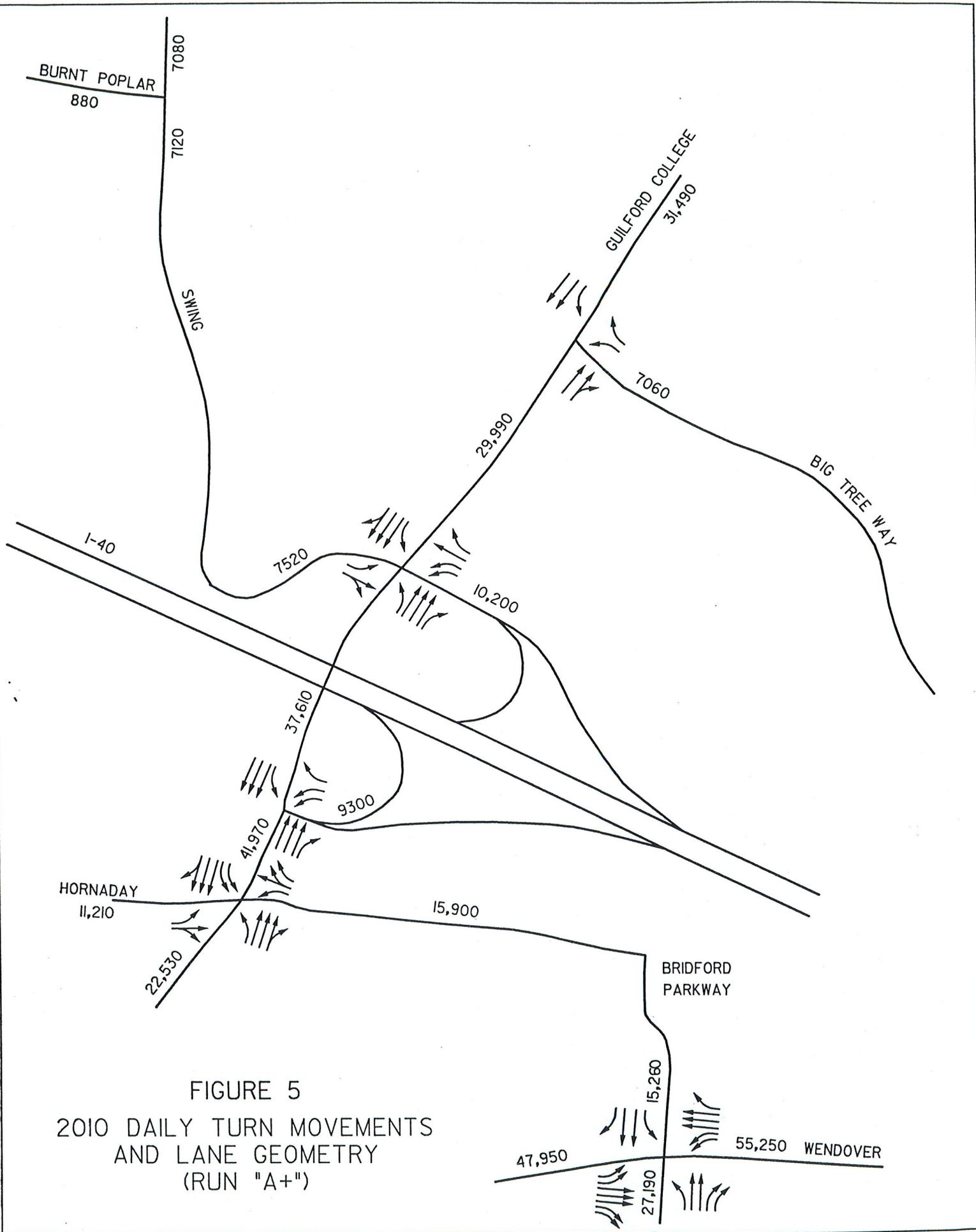


FIGURE 5
 2010 DAILY TURN MOVEMENTS
 AND LANE GEOMETRY
 (RUN "A+")

CONCLUSIONS

Overall, this study should be viewed as conservative in terms of projecting traffic volumes and capacity deficiencies. The potential for new development and rezoning in the study area is high, and could easily exceed the assumed rates. In addition, much of the traffic carried by Wendover, Guilford College, and I-40 passes entirely through the study area, and this traffic could increase significantly due to external growth and development. Finally, delay in completing any one of several major improvement projects could have the combined effects of increasing traffic volumes and reducing capacities.

The most significant impact of extending Bridford Parkway to connect with Burnt Poplar Road is a dramatic reduction in traffic on Guilford College Road between the existing locations of Hairston Street and Big Tree Way. The elimination of nearly 25,000 trips (a 37% reduction) yields considerable benefits to the operation of the interchange with I-40. Widening Guilford College Road by two lanes and adding turn lanes to cross streets (Run "A+") cannot provide the same degree of improvement. In fact, the extension of Bridford Parkway appears to be the only feasible alternative offering significant long-term relief for Guilford College Road in the vicinity of I-40. It is also the best option for improving access (especially from the north) to development in the area bounded by I-40, Guilford College Road, and Wendover Avenue.

Detailed discussions of facilities in the influence area follow:

Bridford Parkway - Although extending the Parkway increases traffic on the existing portions of Bridford, volumes remain within the facility's capacity. There is little effect south of Wendover Avenue, with daily traffic increasing from 27,190 to 28,370 (less than 5%). Volumes between Wendover and Hornaday/Hairston increase 32%, but at 20,090 vehicles per day, remain well within capacity. The highest volumes on the extension (21,450 vpd) occur between Big Tree and Guilford College. Most of this traffic is oriented towards the north leg of Guilford College Road. To the west, volumes drop by 2/3, to about 8,000 vehicles/day. Once again, most of the demand is oriented north, this time on Swing Road. West of Swing, volumes are reduced by over 3/4.

Guilford College Road - Extending Bridford has little effect on Guilford College Road south of Hornaday/Hairston, with volumes dropping less than 3%. North of Big Tree Way, volumes increase 7% with the extension. Programmed improvements will provide adequate capacity for this increase, although some deterioration in level-of-service can be anticipated. While as-planned (Run "A") conditions through the I-40 interchange are not yet critical, there is minimal reserve capacity, providing little margin for error.

Wendover Avenue - Although volumes at the intersection of Bridford Parkway and Wendover Avenue increase 4% with the extension of Bridford, level-of-service is not significantly affected. This is because the re-oriented turning movements are more balanced, and happen to take advantage of the intersection's available capacity (i.e.,

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fewer left turns, higher proportions of through movements). To the east of Bridford Parkway, the extension decreases volumes on Wendover Avenue about 1%; volumes to the west increase 1%.

Burnt Poplar Road - Tying Bridford Parkway into Burnt Poplar doubles the volume on Burnt Poplar, but at 1,750 vehicles/day it remains below capacity for a two-lane road. Although the connection with Bridford Parkway Road provides a continuous facility from Hilltop Road to Gallimore Dairy Road, it remains less attractive for east-west traffic than parallel routes in the western I-40 corridor.

Big Tree Way - Volumes on Big Tree to the east of the Bridford Parkway extension increase about 22%, but remain acceptable for a 2-lane facility (8,060 vehicles/day). Bridford Parkway remains primarily a north-south facility, and the "T" intersection extension does not create an especially attractive cut-through via Big Tree Way.

Swing Road - South of Burnt Poplar, the extension of Bridford Parkway reduces volumes on Swing Road from about 7,500 vehicles/day to less than 4,500. The existing two-lane facility provides an acceptable level-of-service in either case. North of Burnt Poplar, daily volumes increase from 7,080 to 11,200, approaching available capacity.

Hornaday Road/Hairston Street (east of Guilford College) - The model suggests that daily volumes on this facility drop from 15,900 to 3,360 due to the extension of Bridford Parkway. Although a substantial diversion is anticipated, it is unlikely that volumes will be reduced quite that low. No changes are recommended in conjunction with the Bridford extension.

Hornaday Road (west of Guilford College) - Volumes on Hornaday Road are not affected by the project.